DEC 1951

25X1 [redacted]

CONFIDENTIAL

25X1 [redacted]

CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

25X1 [redacted]

COUNTRY USSR

SUBJECT Abstract of Formation of Silicon Carbide During the Electrolysis of Cryolite - Aluminum Oxide Melts by P F Antipin (Corres. of Academy of Science of USSR and L I Ivanova

[redacted] 25X1

DATE DISTR. 28 JUL 53

NO. OF PAGES 2

NO. OF ENCLS.

SUPP. TO REPORT NO.

25X1 THIS IS UNEVALUATED INFORMATION

[redacted]

Formation of Silicon Carbide During the Electrolysis of Cryolite-Aluminum Oxide Melts

1. The study of the reaction of silicon-dioxide (silica) with fused cryolite-alumina mixtures in presence of aluminum and carbon is of great importance for the electrolytic production of silicon aluminum alloys. However, there are difficulties in the industrial application of this method[1, 2].

2. The authors found in their experiments that the electrolytic formation of aluminum silicon alloys is disturbed by the formation of silicon carbide which, because of its stability, accumulates in the electrolytic cells during the electrolysis (see Table I of the article).

3. The authors built a laboratory model of the industrial electrolytic cell, consisting of graphite crucibles with graphite rods as anodes and with (molten) aluminum on the bottom of the crucibles as cathodes. The working temperature was 1000°C. Under these conditions the formation of silicon carbide is explained as follows:

1) Reduction of silica by metallic aluminum:

$$3SiO_2 + 4Al = 2Al_2O_3 + 3Si$$

2) Formation of the carbide:

$$Si + C = SiC \text{ or}$$
$$Al_4C_3 + 3Si = 4Al + 3SiC, \text{ or}$$
$$Al_4C_3 + 3SiO_2 = 2Al_2O_3 + 3SiC,$$

25X1 [redacted]

CONFIDENTIAL

25X1 [redacted]

DISTRIBUTION →	STATE	X	ARMY	X	NAVY	X	AIR	X	FBI		

since aluminum carbide Al_4C_3 was always present. The reaction $SiO_2 + 2C = Si + 2CO$ does not occur at 1000°C. The presence of silicon carbide was proven by the X-ray density and by chemical analysis.

4. The possibility of the reactions above was proven by the calculation of free energies and equilibrium constants.

References

1) K P Batashev and Ja I Zhurin, Metallurgy 2, 66 (1933),

2) V P Mashovetz and E S Artobolevskaja, Tr NIIS of aluminum 9, 5 (1934).

5. This investigation was done in the Research Institute of the USSR for Aluminum and Magnesium, and shows the close connection between industry and research institutes in the USSR. Industrial processes are studied in the laboratory using industrial equipment on a smaller scale.

6. No details are reported in the article. Nevertheless, it seems to indicate that a work of good quality was done in the institute.

7. /Reference Table I mentioned in abstract pertains to illustrations contained in the original Russian article as it appeared in Dokl Akad Nauk USSR LXX, No 2, 283-284, 1950./

- end -